

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5

IN THE MATTER OF)	
)	
Buckeye Egg Farm, L.P.)	ADMINISTRATIVE ORDER
)	
Proceeding Under)	EPA-5-2002-113(a) OH-08
Section 113(a)(3) of)	
the Clean Air Act,)	
42 U.S.C. § 7413(a)(3))	

Administrative Order

1. The Director of the Air and Radiation Division, United States Environmental Protection Agency (U.S. EPA), Region 5, is issuing this Order to Buckeye Egg Farm, L.P., under Section 113(a)(3) of the Clean Air Act (Act), 42 U.S.C. § 7413(a)(3).

Statutory Authority

2. The Administrator of U.S. EPA may require any person who owns or operates an emission source to "make reports; install, use and maintain monitoring equipment; sample emissions; provide information required by the Administrator" under Section 114(a)(1) of the Act, 42 U.S.C. § 7414(a)(1). The Administrator has delegated this authority to the Director of the Air and Radiation Division.

3. Under Section 113(a)(3) of the Act, 42 U.S.C. § 7413(a)(3), the Administrator of U.S. EPA may issue an order requiring compliance to any person who has violated or is violating any requirement of an information request issued under Section 114 of the Act (Section 114 Request). The Administrator has delegated this authority to the Director of the Air and Radiation Division.

Findings

4. Buckeye Egg Farm, L.P. (Buckeye) owns and operates chicken egg production facilities in at least three counties (Licking, Wyandot and Hardin Counties) in Ohio. The specific addresses and/or mailing addresses for these facilities are as follows:

Croton Facility
Buckeye Egg Farm, L.P.
11212 Croton Road
Croton, Licking County, Ohio 43013

Marseilles Facility
Buckeye Egg Farm, L.P.
11873 County Road 77
Harpster, Wyandot County, Ohio 43323

Mt. Victory Facility
Buckeye Egg Farm, L.P.
20279 County Road 245
Mt. Victory, Hardin County, Ohio 43340

5. Each facility emits, among other pollutants, particulate matter.

6. Buckeye owns or operates an "emission source" at each facility within the meaning of Section 114(a)(1) of the Act, 42 U.S.C. § 7414(a)(1).

7. On January 19, 2001, the Director of the Air and Radiation Division, U.S. EPA, Region 5, issued a Section 114 Request to Buckeye. Exhibit 1 of this Order is a copy of the Section 114 Request.

8. U.S. EPA's Section 114 Request to Buckeye required Buckeye to conduct:

- A. Particulate matter (PM) testing using the method specified in 40 C.F.R. Part 60, Appendix A, Method 5 (Method 5) for three seasons (spring, summer and winter) at two Croton buildings (one pre-1990 and one post-1996), one Marseilles building and one Mt. Victory building. This testing and analysis must include, among other things, size distribution analysis of the PM collected for each Method 5 test required; and
- B. PM emission testing using a "secondary method as outlined in the Quality Assurance Project Plan provided with the 114" at two Croton buildings (one pre-1990 and one post-1996), one Marseilles building and one Mt. Victory building.

9. Buckeye received U.S. EPA's Section 114 Request on January 24, 2001.

10. Following several conversations between representatives of U.S. EPA and Buckeye, U.S. EPA extended the time frame for performing emission testing required by the 114 Information Request from March to June, 2001. U.S. EPA granted this extension by letter issued in April, 2001, and stated that the June 2001 testing would satisfy Buckeye's summer season emission testing requirement for the Marseilles facility. In addition, U.S. EPA postponed the remaining testing at the Marseilles, Croton and Mt. Victory facilities required by the Section 114 Request (Method 5 seasonal testing and/or secondary method testing) until the results from the initial emission testing at the Marseilles facility were received and reviewed.

11. On June 4-8, 2001, Buckeye performed the limited Method 5 summer testing required by the Section 114 request, modified as described in paragraph 10, above.

12. On August 9, 2001, Buckeye submitted the results of its June 4-8, 2001 testing to U.S. EPA.

13. On December 11, 2001, U.S. EPA sent a letter to Buckeye discussing the emission test results submitted by Buckeye on August 9, 2001. The letter includes U.S. EPA's emission calculations showing potential particulate matter emissions from Buckeye's Marseilles facility exceed 700 tons per year.

14. On February 19, 2002, U.S. EPA contacted Buckeye to discuss Buckeye's obligation to comply with the remaining testing requirements in U.S. EPA's Section 114 Request.

15. By letter dated March 5, 2002, Buckeye refused to perform any testing beyond the testing it performed in June, 2001.

16. On March 28, 2002, U.S. EPA responded to matters raised in Buckeye's March 5, 2002 letter, offered Buckeye an opportunity to document its claims, including identifying options for modifying the testing requirements, and advised Buckeye that its failure to comply with a Section 114 Request constitutes a violation under Section 113 of the Clean Air Act.

17. U.S. EPA has received no response to its March 28, 2002 letter.

18. Buckeye has violated and continues to violate the Section 114 Request by failing to conduct:

- A. Spring and winter season PM emission testing using Method 5 at two Croton facility buildings, one Marseilles building, and one Mt. Victory building;
- B. Summer season PM emission testing using Method 5 at two Croton facility buildings and one Mt. Victory building; and
- C. Emission testing using a secondary method as outlined in the Section 114 Request, and as specified in paragraph 8, above.

Compliance Program

19. Buckeye must conduct emission testing as outlined in Appendix A, paragraph 6 of the Section 114 Request, pursuant to the Quality Assurance Project Plan provided with the Section 114 Request, and as an attachment to this Order (hereinafter the Secondary Method Emission Testing) in accordance with the following schedule:

- A. During the winter of 2003 season (i.e., January 1, 2003 through March 15, 2003), spring of 2003 season (i.e., April 1, 2003 through June 15, 2003) and summer of 2003 season (i.e., June 16, 2003 through September 1, 2003) at two Croton facility buildings; and
- B. During the fall of 2003 season (i.e., September 15, 2003 through November 30, 2003), winter of 2004 season (i.e., January 1, 2004 through March 15, 2004) and summer of 2004 season (i.e., June 16, 2004 through September 1, 2004) at one Marseilles facility building and one Mt. Victory facility building.

Buckeye shall submit a report summarizing each test within thirty days following completion of each test.

20. As an alternative to complying with paragraph 19 of this Order, above, Buckeye may conduct particulate matter emission testing at two Croton facility buildings using the Secondary Method Emission Testing for three seasons (winter, spring and summer of 2003), so long as Buckeye notifies U.S. EPA in writing within thirty days of its receipt of this Order that Buckeye shall conduct the Secondary Method Emission Testing within sixty days of receipt of this Order, and that Buckeye stipulates to the following:

- A. Buckeye stipulates to the validity of the results of the Secondary Method Emission Testing; and
- B. Buckeye stipulates that the two Croton facility buildings are similar enough to the remaining Croton facility buildings, the Marseilles facility buildings and the Mt. Victory facility buildings that emission data generated at the two Croton facility buildings can be reasonably extrapolated to estimate emissions from the remaining Croton facility buildings, the Marseilles facility buildings and the Mt. Victory facility buildings. If Buckeye determines that emissions data generated at one or more of the two Croton facility buildings cannot be reasonably extrapolated to estimate emissions at the remaining Croton facility buildings, the Marseilles facility buildings and Mt. Victory facility buildings, then Buckeye must identify and submit for U.S. EPA approval a list of one or more buildings to be included in the emissions monitoring program that will be representative of the remaining Croton facility buildings, the Marseilles facility buildings and Mt. Victory facility buildings. Buckeye's submittal must explain why emissions data at one or more of the two Croton facility buildings will not be capable of reasonable extrapolation to the remaining Croton facility buildings, the Marseilles facility buildings and the Mt. Victory facility buildings, and must identify which building(s) will be represented by which proposed additional test facility building. U.S. EPA will notify Buckeye whether it approves or disapproves inclusion of additional test facility building(s) and the reasons for any disapproval. If U.S. EPA disapproves any proposed facility building(s), within fourteen days of Buckeye's receipt of U.S. EPA's letter of disapproval, Buckeye must submit for U.S. EPA approval alternate facility building(s) to be included consistent with U.S. EPA's reasons for disapproval of the originally proposed additional facility building(s).

If Buckeye elects to conduct Secondary Method Emission Testing as set forth in this paragraph, Buckeye shall submit a report of its results within thirty days following the completion of such Secondary Method Emission Testing.

21. Buckeye must send all reports and written notifications required by this Order to:

Attn: Compliance Tracker, AE-17J
Air Enforcement and Compliance Assurance Branch
U.S. EPA, Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604.

General Provisions

22. This Order does not affect Buckeye's responsibility to comply with other local, state, and federal laws and regulations.

23. This Order does not restrict U.S. EPA's authority to enforce Section 114 of the Act, or any other section of the Act.

24. Nothing in this Order limits U.S. EPA's authority to seek appropriate relief, including penalties under Section 113 of the Act, 42 U.S.C. § 7413, for Buckeye's violations of the Section 114 Request.

25. Failure to comply with this Order may subject Buckeye to penalties of up to \$27,500 per day for each violation under Section 113 of the Act, 42 U.S.C. § 7413, and the Civil Monetary Penalty Inflation Adjustment Rule, 40 C.F.R. Parts 19 and 27, as mandated by the Debt Collection Improvement Act of 1996, 31 U.S.C. § 3701.

26. The terms of this Order are binding on Buckeye, its assignees and successors. Buckeye must give notice of this Order to any successors in interest, prior to transferring ownership, and must simultaneously verify to U.S. EPA, at the above address, that Buckeye has given the notice.

27. This Order is not subject to the Paperwork Reduction Act, 44 U.S.C. § 3501 et seq., because it seeks collection of information by an agency from specific individuals or entities as part of an administrative action or investigation.

28. U.S. EPA may use any information submitted under this Order in an administrative, civil, or criminal action.

29. Section 113(a)(4) of the Act, 42 U.S.C. § 7413(a)(4), states that an Order shall not take effect until the person to whom it is issued has had an opportunity to confer with U.S. EPA about the alleged violation. Therefore, Buckeye has the opportunity to confer informally with U.S. EPA concerning this Order. If Buckeye desires a conference, it must schedule a conference with U.S. EPA by calling Kevin Vuilleumier at (312) 886-6188, within seven days of Buckeye's receipt of this Order,

to schedule such a conference. In addition, Buckeye may submit a written response and any other documents to U.S. EPA that Buckeye believes are relevant to this Order or U.S. EPA's January 19, 2002 Section 114 Request. This written response and all additional documents must be submitted to the address in paragraph 21 within 30 days of Buckeye's receipt of this Order.

30. If U.S. EPA determines that any element of this Order warrants modification as a result of the conference, or any other written responses or documents submitted by Buckeye, or for other reasons, U.S. EPA will modify the Order in writing and issue a copy to Respondent.

31. No modification to this Order will be effective unless and until it is issued in writing by U.S. EPA.

32. This Order is effective on the fourteenth day following Buckeye's receipt of this Order.

10/10/02
Date

Enclosures



Stephen Rothblatt, Acting Director
Air and Radiation Division

EXHIBIT 1
U.S. EPA's Section 114 Request

CERTIFICATE OF MAILING

I, Loretta Shaffer, certify that I sent the Administrative Order, EPA Order No. **EPA-5-02-113(a)OH-08**, including Exhibits 1 and 2, by Certified Mail, Return Receipt Requested, to:

C.T. Corporation System
3810 Carew Tower
Cincinnati, OH 45202

Bill Glass, Chief Operating Officer
Buckeye Egg Farm, L.P.
11212 Croton Road
P.O. Box 173
Croton, Ohio 43013-0173

David Northrup
Samuels and Northrup Co., LPA
180 East Broad Street, Suite 816
Columbus, Ohio 43215

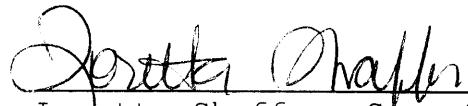
I also certify that I sent a copy of the Administrative Order, EPA Order No. **EPA-5-02-113(a)OH-08**, by First Class Mail to:

Isaac Robinson, APC Supervisor
Central District Office
3232 Alum Creek Drive
Columbus, Ohio 43207-3417

Don Waltermeyer, APC
Northwest District Office
347 Dunbridge Road
Bowling Green, Ohio 43402

Robert Hodanbosi, Chief
Division of Air Pollution Control
Ohio Environmental Protection Agency
Lazarus Government Center
P.O. Box 1049
Columbus, Ohio 43216-1049

on the 10 day of October 2002.



Loretta Shaffer, Secretary
AECAS (OH/MN)
(312) 353-5723

CERTIFIED MAIL RECEIPT NUMBER: 7001 0320 0004 1467 1743

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5

IN THE MATTER OF:

Buckeye Egg Farm, L.P.
11212 Croton Road
P.O. Box 173
Croton, OH 43013-0173

ATTENTION: Bill Glass
Chief Operating Officer

Request to Provide Information Pursuant to the Clean Air Act

The United States Environmental Protection Agency (U.S. EPA) is requiring Buckeye Egg Farm, L.P. (Buckeye or you) to submit certain information about the following facilities:

a large chicken egg production facility in and around Hartford, also referred to as Croton, Licking County, Ohio, with a mailing address of 11212 Croton Road, Croton, Ohio 43013, known as the "Croton facility"; a large chicken egg production facility located at 20279 County Road 245, Mt. Victory, Hardin County, Ohio, near the Village of LaRue, Hardin County, Ohio, known as the "Mt. Victory facility"; and a large chicken egg production facility located at 11873 County Road 77, Harpster, Wyandot County, Ohio, known as the "Marseilles facility".

Appendix A specifies the information that you must submit. You must send this information to us according to the schedule in Appendix A.

We are issuing this information request under section 114(a) of the Clean Air Act (Act), 42 U.S.C. § 7414(a). Section 114(a)

authorizes the Administrator of U.S. EPA to require the submission of information. The Administrator has delegated this authority to the Director of the Air and Radiation Division, Region 5.

Buckeye owns and operates emission sources in Licking, Hardin and Wyandot Counties in Ohio. We are requesting this information to determine whether your emission sources are complying with the State Implementation Plan, the Prevention of Significant Deterioration requirements at Subchapter I, Part C of the Clean Air Act, 42 U.S.C. §§ 7470-7479 and 42 U.S.C. §§ 7491-7492, and Section 502 and 503 of the Clean Air Act (42 U.S.C. § 7661-7661f).

You must send all required information to:

Attn: Compliance Tracker, AE-17J
Air Enforcement and Compliance Assurance Branch
U.S. Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604

With copies to:

Isaac Robinson, APC Supervisor
Central District Office
3232 Alum Creek Drive
Columbus, Ohio 43207-3417

Don Waltermeyer, APC
Northwest District Office
347 Dunbridge Road
Bowling Green, Ohio 43402

You may assert a claim of business confidentiality for any

portion of the submitted information, except emission data, under 40 C.F.R. part 2, subpart B. Information subject to a business confidentiality claim is available to the public only to the extent allowed under 40 C.F.R. part 2, subpart B. Failure to assert a business confidentiality claim makes all submitted information available to the public without further notice.

Buckeye must submit all requested information under an authorized signature certifying that the information is true and complete to the best knowledge of the certifying official after due inquiry. Knowingly providing false information, in response to this request, may be actionable under section 113(c)(2) of the Act, and 18 U.S.C. §§ 1001 and 1341.

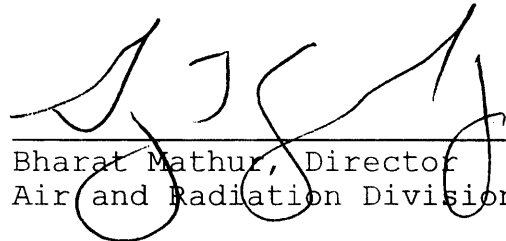
We may use any information submitted in response to this request in an administrative, civil, or criminal action.

This request is not subject to the Paperwork Reduction Act, 44 U.S.C. § 3501 et seq., because it seeks collection of information from specific individuals or entities as part of an administrative action or investigation.

Failure to comply fully with this request for information may subject Buckeye to an enforcement action under section 113 of the Act, 42 U.S.C. § 7413.

You should direct any questions about this request for information to Kevin Vuilleumier at (312) 886-6188.

1/19/01
Date

 - ACTING
Bharat Mathur, Director
Air and Radiation Division

APPENDIX A

Buckeye must submit the following information for its Croton facility, Mt. Victory facility, and Marseilles facility within 30 days of receipt of this request. Include copies of all documents that relate, pertain, or refer to each information request:

1. A plot showing the layout of all buildings at the Croton facility, the Mt. Victory facility, and the Marseilles facility and an area map showing the location of each facility and their property boundaries, including property owned and controlled (e.g., lease) by Buckeye.
2. A list of all operational parameters monitored by Buckeye at each facility.
3. A spreadsheet or table showing monitored operational parameters for each facility from 1999 to present. This information must be broken down by building and include, at a minimum:
 - a. The number of fans available for operation,
 - b. The number of fans operating at any given time, and
 - c. The ventilation rates/air flow rates at each fan during operation (daily average in standard cubic feet per minute). If each fan is a constant fan (without variable speeds), this information will be the fans design air flow rate and must be documented

If this information is available electronically, submit a disk(s) with the data in a format viewable through standard spreadsheet software (Lotus 1-2-3, Microsoft Excel, etc.).

As an example, this table may look like the following:

<u>Facility</u>	<u># fans available</u>	<u>Date</u>	<u># fans operating</u>	<u>Vent. Rate</u>
Croton:				
Building-1	54	01/01/99	5	1,000 500 1,000 2,000 2,000
Building-2				

4. The design capacity for each chicken house at each facility. This capacity must be the maximum number of chickens that could be housed in each building at each facility.

Buckeye must conduct the following testing within 60 days of receipt of this request. An intent to test form must be submitted by Buckeye to U.S. EPA and approved by U.S. EPA at least thirty days prior to conducting the tests.

5. Buckeye must perform stack testing for particulate matter at two Croton facility buildings (one Croton building must have been constructed before 1990, and one Croton building must have been constructed after 1996), one Marseilles building and one Mt. Victory building. The stack testing must consist of total enclosure of at least three operating fans vented to either a single stack where measurements will be performed independently (e.g., each fan will have its own duct for sampling). Total enclosure will be established in accordance with approved U.S. EPA methodology. The stack test(s) will include continuous measurements for one week during a minimum of three representative periods (e.g., spring, summer, winter), for a total of 3 weeks of measurements and shall be conducted in accordance with Method 5 as described at 40 C.F.R. Part 60, Appendix A. Sample traverses, stack gas velocity and volumetric flow rate, gas analysis for carbon dioxide, oxygen, excess air, dry molecular weight, and moisture content shall be measured using their respective U.S. EPA reference Method (Method 1, 2, 3C, or 4). Perform a size distribution study with each test to determine the concentration of particulate matter at various aerodynamic diameters. At a minimum, determine and provide concentrations of total particulate matter as well as particulate matter with an aerodynamic diameter of 10, 5 and 2.5 micrometers or less. The results must be presented in the following units: mg/hr (lb/hr); mg/hr-bird (lb/hr-bird); and mg/500 kg live-weight (lb/500 kg live-weight). Document the total number of chickens present during the testing as well as operating parameters as monitored during the test period.
6. Buckeye will also perform testing for PM, PM₁₀ and CO₂ using a second testing method. Testing will be performed at two Croton facility buildings (one Croton building must have been constructed before 1990, and one Croton building must have been constructed after 1996), one Marseilles building and one Mt. Victory building. Attachment A presents a quality assurance project plan (QAPP) to be used in developing the second testing method. This testing will be performed on a continuous basis for one week four times during the year (once per season). The first testing for this method will be conducted within 60 days of receipt of this request.

7. The results of each test will be submitted to U.S. EPA, in accordance with this request, 30-days after each test is complete.

ATTACHMENT A

Project Description

This sampling entails an approach to measure pollutant emissions directly at the source. It will use a dust sampling system to monitor the concentrations of PM and PM₁₀ in the exhaust fans and the air inlets of a large caged-hen laying house.

PM and PM₁₀ will be sampled using a vacuum pump, 10 critical orifices each and, for PM₁₀, 10 PM₁₀ preseparator/cassette filter holder assemblies. The samples will be weighed using standard protocol for gravimetric analysis.

In addition, concentrations of carbon dioxide (CO₂) will be measured using a 0-5,000 ppm photoacoustic infrared carbon dioxide analyzer. The accuracy of this analyzer will be ± 100 ppm. The measurement range will be set at 0-5,000 ppm. The measurement of CO₂ is to obtain data that will be useful to monitor the mass (gas) transportation and (spatial and temporal) distribution in the building, to study the indoor air quality and to validate the measurement of PM₁₀.

The airflow rates of selected ventilation fans will be estimated by using a portable fan test chamber. The building ventilation rate will be obtained by monitoring the operation of all the fans and the airflow rate of a single fan, since all the ventilation fans are identical. The PM emission rates will be calculated by multiplying the measured concentrations by the airflow rates.

Quality Objectives and Criteria for Measurement Data

The overall data quality objective is to generate data of sufficient quality to satisfy the objectives of the project stated above. Data will undergo quality assurance review which will assess, among other things, representativeness, completeness, comparability, and accuracy and precision.

Data representativeness will be assured by the overall sampling design, which includes high frequency and multi-location sampling and a week-long measurement period.

Data completeness will be achieved by assuring that valid data obtained from the measurement system will be no less than 90

percent of the scheduled sampling.

Data comparability will be maintained by consistent use of the same analytical methods used in recent studies in confined swine facilities.

Accuracy and precision for the PM and PM₁₀ measurement will be assessed in accordance with the equipment manufacturer's instructions included with required equipment. The filter weighing balance must be calibrated at least annually.

Accuracy and precision for the carbon dioxide measurement will be assessed by challenging the measurement system with zero air and a known concentration of carbon dioxide (CO₂) span gas. Carbon dioxide concentration measurement will be performed in accordance with the equipments instruction manual.

Failure to achieve any of the acceptance criteria will trigger an immediate examination of sampling and/or analytical practices in order to correct the problem before the next round of scheduled sampling.

Documents and Records

Field logs will be maintained and include, but not be limited to, site drawings, daily notes, monitoring notes, results of in-field quality control checks, and any deviations from this quality assurance project plan.

Field test documentation and electronic data storage will be maintained in accordance with the standard operating procedures.

Records resulting from this project will be retained for a period of not less than three years.

Measurement Data Acquisition

Sampling Process Design (Experimental Design)

Measurements of CO₂ will be conducted sequentially at multiple locations to obtain gas emission rate, and temporal and spatial variations of gas concentrations. A gas sampling system will be constructed to allow automatic sequential air sampling from three groups of sampling locations. Teflon tubes (1/4" ID) will be used to transport air from nine exhaust locations (Group 1 - four fans on the west side of the building and Group 2 - five fans on the east side of the building) and four air inlets (Group 3) in the ceiling. A filter will be installed at the opening head of each gas sampling line at the sampling location to remove particulate. The selected gas stream will pass through Teflon sampling manifolds.

A vacuum pump (P1) will pull air from the sampling locations to the concentration analyzers. The sample gas stream from each group will be measured continuously for 10 minutes before switching to another sampling group. The first nine minutes of gas concentration data will be ignored to allow the measurement system to equilibrate. The measurement of the three groups of sampling locations will need 30 minutes. Thus, 48 CO₂ measurements will be obtained daily for each group. These data with 30 minute time resolution will allow analyzing the temporal variations of the gas concentrations. Gas emission rates will be calculated using concentration differences between groups (Group 1 vs Group 3 and Group 2 vs. Group 3) combined with ventilation rate.

A second set of gas analyzers will be set up to focus on spatial variations of gas concentrations. The measurement will be divided into two periods. At the first period, it will be measuring each of the 12 sampling locations (excluding one fan in Group 2) measured by the first set of analyzers. The 12 locations will be measured sequentially. Measurement at each location will take 10 minutes and it will need two hours to measure all locations. Thus, 12 concentration readings will be obtained daily. The data will be used to study the concentration variations within each group of sampling locations to validate the selection of these locations.

At the second period, the second set of gas analyzers will be measuring only two locations to determine both spatial and temporal variations. Some of these locations will be at the floor to determine the portion of air pollutants produced by the birds on the second floor as compared to the manure stored on the first floor. The selection of the two locations will be determined upon the completion of the first measurement period and based on the data at hand at that time.

PM and PM₁₀ will be sampled once every day for 24 hours at eight exhaust fans, side by side with continuous emissions monitoring system (CEMS) sampling points, and one incoming air location using a nine-port manifold connected to a vacuum pump system. The sampling location will be 10 centimeters adjacent to the CEMS sampling location to ensure free flow of air around the sampling head. A fractionating inlet will be utilized at each point.

Twelve semiconductor sensors will be used to measure temperatures at the gas and dust sampling locations (eight exhaust fans and four air inlets). The sensors will be calibrated prior to use and recalibrated at the conclusion of the test. An electronic relative humidity/temperature probe will monitor outdoor relative

humidity and air temperature. Another relative humidity/temperature probe will be used to monitor indoor relative humidity and an additional air temperature at the center of the manure pit. Building static pressure will be monitored at four locations representing east, west, north and south sides of the building.

The wall fans will be tested with a portable fan test chamber to determine their actual airflow rates at different static pressures. Their operation will be monitored with voltage-sensing relays.

Sample Handling and Custody

PM and PM₁₀ filter samples will be taken using 47-mm filter cassettes. The filters will be equilibrated at a set temperature ($20 \pm 1^\circ\text{C}$) and relative humidity ($50 \pm 5\%$) for at least 24 hours prior to pre-and post-weighing, and weighed using standard protocol for gravimetric analysis.

Samples will be labeled and logged in on standard field data sheets at the time of placing and collecting the samples. The samples will then be transferred directly to the laboratory for weighing or stored for later weighing. Information on the data sheets includes date, time of day, personnel, sampling location, airflow rate, sampling start time, sampling stop time, temperature, any unusual conditions or observations, weight of pre-sampling, weight of post-sampling, and PM concentration. All field data will be recorded and checked for completeness and accuracy before leaving the site. Laboratory data sheets will be prepared and signed as samples are processed. The samples remain in the custody of sampling personnel at all times precluding the need for chain of custody documentation.

All other measurement will be taken in-situ in the buildings and no sample custody will be involved.

Analytical Methods

Approved analytical methods will be used in all experiments. Analytical data will be generated in accordance with the standard operating procedures and instrument manufacturer's manuals.

The sampling team will undertake corrective actions for gas and particulate concentration measurement. Corrective action will be necessitated by any deviation from published procedure or instruction manual direction.

Quality Control

Quality assurance and quality control at all facilities includes

the use of properly maintained and reliable instrumentation, approved analytical methodologies and standard operating procedures, external validation of data, well-trained analysts, electrical backups, audits, and documentation. When appropriate, published EPA analytical methodologies will be used. Logs will be maintained for each instrument.

Quality control procedures will include the following:

- Calibrations of carbon dioxide analyzers will be conducted regularly.
- On-line results of all the continuous measurement variables will be displayed on a PC screen. Sampling personnel will check the on-line display daily by either remote or on-site access.
- Logged data files in the PC in the previous day will be checked the next business day to find and correct any problem with the system.
- Experienced analysts will run all equipment.
- Internal performance and system audits will be performed.
- A measurement of inlet clean air will be included as a field blank for gas concentration measurement.
- An uninterrupted power system will be used to prevent equipment damage in case of power failure.

Instrument/Equipment Calibration and Frequency

Gas concentration analyzers will be calibrated in accordance with the manufacturer's instruction manuals. Certifications for calibration gases will include two analyses at least one week apart. The certified calibration gases will consist of zero air and 4,000 ppm carbon dioxide in nitrogen. Calibrations of carbon dioxide analyzers will be conducted weekly.

Gas airflows of the PM and PM₁₀ samplers will be calibrated using precision airflow calibrators (0.020-6 Lpm and 2-30 Lpm flow rates). Calibration frequency will be determined in accordance with the manufacturer's instructional manual.

Calibration records will be maintained in accordance with the applicable standard operating procedure or instrument manufacturer's operation manuals.

Inspection/Acceptance of Supplies and Consumables

All atmospheric gaseous measurement will be traceable to dual-analyzed and certified standards from a reputable supplier. No additional requirements are applicable.

Data Management

Instrumental data will be collected and stored in accordance with

the applicable standard operating procedure or instrument manufacturer's operations manual. Raw data will be saved as tab delimited ASCII files.

All temperature and relative humidity data will be electronically stored and compiled in a manner that will facilitate computation of 30-minute and daily averages.

Sampling personnel will keep the following logs: daily notes including site drawings, deviations from QA, and other notations. The logs will contain measurement activities and monitoring notes. A third party witness will sign and date all log notes. All notes will be contained in a centralized notebook. All necessary records for additional monitoring instruments will also be kept.

A large portion of the data will also be maintained electronically in the form of spreadsheets. Electronic raw data and computer records will be backed-up weekly on a network drive (backed-up daily) with copies stored at the laboratory. In addition to computer storage, raw tables or graphs will be printed out and stored in a loose-leaf notebook in the laboratory.

Assessments and Response Actions

Sampling personnel will be responsible for evaluating the data and assessing the data in accordance with validation procedures. They will assess the data for their representativeness, completeness, comparability, and accuracy and precision as outlined in a previous section.

Sampling personnel will also be responsible for preparing the portions of a report concerning the results from their respective instrumentation. They will integrate the data and jointly prepare a draft measurement report for review.

Reports to be Submitted

The draft and final project reports will contain all valid monitoring data expressed as 30-minute and daily values. The report will incorporate graphical representations of the location of all measurements taken. The report will also contain the numerical and qualitative results of all quality control measures on all measurement systems and will compare them to the applicable acceptance criteria. In the event that data must be invalidated, the reason for data invalidation shall be identified with the resultant corrective action.

Review drafts and final reports will be distributed to, at least:

Kevin Vuilleumier	U.S. EPA, R5
Cary Secrest	U.S. EPA, HQ OECA
Isaac Robinson	OEPA, CDO
Don Waltermeyer	OEPA, NWDO

Data Review, Verification, and Validation

All data generated under this QAPP will be reviewed and validated by sampling personnel. Data quality assessment will be performed by sampling personnel.

Raw data review will be done within two business days after the data were recorded from measurement. Verification of the measurement data will be done during initial processing each week using appropriate software.

Validation and Verification Methods

Data will be validated and verified by comparison with instrumental performance parameters as identified in the applicable standard operating procedure or instrument operation manual. Data validation and verification will also be performed by checking the recorded test activity and change of the building environment. Data will be evaluated for compliance with stated objectives for representativeness, precision, and accuracy. However, the evaluation process used to find and correct an error may not be defined in this QAPP because not all possible errors and corrections can be anticipated.

Reconciliation with User Requirements

Any data not meeting the data quality objectives as outlined above will be flagged as invalid for comparison to screening level criteria.

CERTIFICATE OF MAILING

I, Loretta Shaffer, certify that I sent a Request to Provide Information Pursuant to the Clean Air Act by Certified Mail, Return Receipt Requested, to:

Buckeye Egg Farm, L.P.
Attn: Bill Glass, Chief Operating Officer
11212 Croton Road
P.O. Box 173
Croton, OH 43013-0173

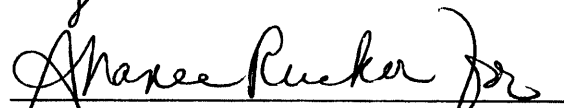
I also certify that I sent a copy of the Request to Provide Information Pursuant to the Clean Air Act by First Class Mail to:

Isaac Robinson, APC Supervisor
Central District Office
3232 Alum Creek Drive
Columbus, Ohio 43207-3417

Don Waltermeyer, APC
Northwest District Office
347 Dunbridge Road
Bowling Green, Ohio 43402

Robert Hodanbosi, Chief
Division of Air Pollution Control
Ohio Environmental Protection Agency
Lazarus Government Center
P.O. Box 1049
Columbus, Ohio 43216-1049

on the 19th day of January 2001.


Loretta Shaffer, Secretary
AECAS (OH/MN)

Certified Mail Receipt Number: 7099 3400 0000 9592 3970

EXHIBIT 2
SECONDARY METHOD EMISSION TESTING QUALITY ASSURANCE PROJECT PLAN

Model Quality Assurance Project Plan

Project: Aerial Pollutant Emissions from Confinement Animal Buildings (APECAB)

[insert names]

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QAPP Distribution List:

Albert J. Heber, Purdue University

Cary Secrest, U.S. EPA Enforcement Division

Kevin Vuilleumier, U.S. EPA, Region 5, Air and Radiation Division

A. Project Management

1. Project/Task Organization and Schedule

1.1. Personnel and Agencies Involved

[Insert Name Affiliation Phone E-mail]

1.2. Personnel Responsibilities/Project Organization

Project Leader:

QAPP/Monitoring Plan Development:

QAPP Review/Approval:

Field Support:

Internal QA/QC audits of field test:

Field Data Analysis:

NH₃ Data Reporting:

H₂S Data Reporting:

PM Data Reporting:

Data Compilation/Final Report:

Final Report Review & Approval:

1.3. Project Schedule (insert dates)

2. Problem Definition/Background

Air pollutants in livestock buildings may represent a risk to the health of livestock and of workers. These air pollutants may also represent a risk of pollution to the wider environment. Three livestock building pollutants of particular interest are ammonia (NH₃), hydrogen sulfide (H₂S), and particulate matter (PM). Odor emitted from livestock buildings contribute to nuisance experienced in areas surrounding livestock production. Carbon dioxide emissions are thought to be an important greenhouse gas.

3. Project/Task Description

3.1. Project Objectives

The objectives of this air sampling and measurement study are to:

1. Quantify aerial pollutant emission rates from animal confinement buildings.
2. Provide valid baseline data on aerial emissions from standard U.S. livestock and poultry confinement buildings to regulators, producers, researchers, students, and other

stakeholders.

3. Determine long-term characteristics of odor, hydrogen sulfide, ammonia, carbon dioxide, and particulate matter emissions from representative types of confinement livestock and poultry buildings.
4. Study effects of ventilation rate, animal weight, humidity, temperature, and manure management on aerial pollutant emissions.

3.2. *Project Description*

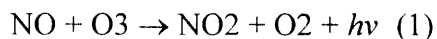
Mobile laboratories will be used to collect aerial pollutant emissions during a 6-month project. The mobile lab will house gas analyzers, environmental instrumentation, a computer, a data acquisition system, calibration gas cylinders, and other equipment needed in the test. Each building type will be sampled continuously in duplicate.

Aerial pollutant emissions will be measured directly at the source, e.g., the exhaust. It will use a continuous emission measurement (CEM) system, gas analyzers, and a tapered element oscillating microbalance to monitor the concentrations of NH₃, H₂S, CO₂ and PM₁₀ in the exhaust fans and the air inlets of two confinement animal buildings. Spot measurements of odor emissions will also be measured every two weeks.

A continuous air sample will be drawn from each building through heated Teflon tubes into a climate controlled instrumentation room inside the trailer. An air sampling system will be constructed to allow automatic sequential air sampling using an array of 3-way solenoids. Teflon tubes (1/4" ID) will be used to transport air at about 4 Lpm from four exhaust air locations, a ventilation inlet location group and an animal exposure location group. The inlet air and animal breathing zone locations will consist of three tubes that mix air from three representative sampling points. A Teflon filter will be installed in a Teflon filter holder at the end of each air sampling line to remove particulates. The selected gas stream will pass through a Teflon sampling manifold in the trailer. The internal pumps of the gas analyzers will pull air from the air-sampling manifold. The sample air stream from each location will be measured continuously for 10 min before switching to the next location. Thus, a 120-min sampling cycle will be applied with a 10-min sampling period resulting in 12 sampling periods per day per location. The first 9 min of gas concentration data will be ignored to allow all measurements to stabilize. A bypass pump will draw air continuously from all inactive (unsampled) sampling tubes at a sampling rate of about 0.33 Lpm. Bypass pumping is expected to reduce the response time of the gas analysis.

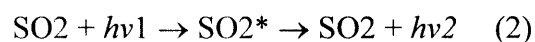
Ammonia will be measured with a chemiluminescence ammonia analyzer (Model 17C, Thermal Environmental Instruments (TEI), Franklin, MA) which is a combination NH₃ converter and an NO-NO₂-NO_x analyzer. Ammonia in the air sample will be oxidized to nitric oxide (NO) with a catalytic converter at 875°C. The NO is further oxidized by gas-phase titration with ozone (O₃) in the analyzer's reaction chamber, producing nitrogen dioxide (NO₂) in an excited state (Equation 1). At reduced pressure created by a vacuum pump, some of the excited NO₂ molecules emit radiation as they return to a lower energy state. With excess O₃, the intensity of

the radiation is proportional to the concentration of NO.



where O₂ is oxygen and $h\nu$ represents photons, particles of light energy, or radiation energy that is generated by moving electric charges. The emitted radiation is detected by a photomultiplier tube (PMT), which in turn generates an electronic signal that is processed into a gas concentration reading. Sample air is drawn at a flow rate of 0.6 Lpm from the converter into the NH₃ analyzer through a particulate filter, a glass capillary, and a solenoid valve. The solenoid valve routes the sample either directly into the reaction chamber (NO mode), through the molybdenum converter and the reaction chamber (NO_x mode), or through the catalytic converter and the reaction chamber (Nt mode). Ammonia concentration is calculated based on the difference between the readings obtained by the Nt and NO_x modes. The ammonia analyzer's measurement range will be set at 20 to 200 ppm, depending on the levels in the building. It has a lower detectable limit of 1 ppb. Its precision is 0.5% of full scale and the 0 to 90% response time is 120 s with 10 s averaging. In the Nt mode, NO and NO₂ are not measured, thus decreasing the response time. If NO and NO₂ are not measured, thus decreasing the response time and reducing the costs of ammonia scrubbers. If the concentrations of NO and NO₂ are negligible based on initial measurements, the Nt mode will be used.

Hydrogen sulfide will be converted catalytically at 325°C to SO₂ followed by measurement with a pulsed fluorescence SO₂ detector (TEI Model 45C) (U.S. EPA. Method EQSA-0486-060) and a high intensity xenon lamp. These analyzers are based on the principle that SO₂ molecules absorb ultraviolet (UV) light and becomes excited at one wavelength, decay to a lower energy state, and emit UV light at a different wavelength (Equation 2).



The emitted UV light is proportional to SO₂ concentration and is detected by a PMT. The SO₂ analyzers have a range of 0.05 to 100 ppm, a response time of 60 s with a 10 s averaging time, and a sample flow rate of 1.0 Lpm. The maximum is adjustable up to 100 ppm. The data averaging time will be set at 60 s. Their guaranteed precision is 1% of reading or 1 ppb (whichever is greater) and its linearity is $\pm 1\%$ of full scale.

Concentrations of carbon dioxide (CO₂) will be measured using 2,000-ppm and 10,000-ppm photoacoustic infrared carbon dioxide analyzers (Model 3600, Mine Safety Appliances, Co., Pittsburgh, PA). The sensor utilizes dual frequency infrared absorption and is corrected for water vapor. The guaranteed accuracy of this analyzer is 2% of full scale and the sample flow rate is 1.0 Lpm.

The PM₁₀ will be monitored with the TEOM instrument, which is a continuous PM monitoring device designated by USEPA as an equivalent method for PM₁₀ (10 microns sized particles and under). The acronym TEOM stands for "Tapered Element Oscillating Microbalance," an inertial

measurement technique predicated on changes in the resonant frequency of an oscillating element as a function of increases in particle mass collected on a filter attached to the element. Changes in the element's resonant frequency are sampled electronically in quasi-real time, providing both continuous and time-averaged measures of mass accumulation that are directly proportional to instantaneous and time-averaged mass concentrations in air, respectively.

The concentration of total suspended particulates (TSP) at the inlets of the exhaust fans will be determined gravimetrically using a multipoint sampler which draws 20 L/min through each filter using a critical venturi method. Filters will be replaced weekly.

Particle size distribution of dust samples will be determined periodically with the following instruments: TSI Aerodynamic Particle Sizer 3320: 0.5 - 20 μm , TSI Dynamic Particle Sizer: 0.3 - 200 μm , Cascade Impactor: 0.4 - 10 μm , Climeet Laser Particle Counter: 0.3 - 10 μm , and a Coulter Multisizer: 0.6 - 20 μm (up to 120 μm).

The airflow measurement method for the confined animal houses consists of monitoring the operation of all the fans (e.g., Whisker Limit Switches, Grainger 4B799) and taking measured static pressure in the building to the published fan curves for the particular fan models. However, a systematic error is probably inherent with this method because of derating due to dust buildup, belt wear and shutter degradation. This error is estimated to be 5 to 20% but the actual fan airflow capacity cannot be measured very accurately (>10% accuracy) in the field. Reported emissions will be too high unless this error is eliminated. Therefore, a FANS analyzer (Becker, 1999), an anemometer system with multiple traversing impellers, will be used to spot measure actual fan airflow capacities in the field after first calibrating the FANS analyzer with each fan model (removed temporarily from the buildings) at the University of Illinois BESS Lab, which can measure fan capacity with an accuracy of $\pm 2\%$.

Optionally, for continuous monitoring of airflow capacity, a vane anemometer (much smaller in diameter than fan diameter) can also be calibrated to the fans and mounted on representative fans in the field.

Ambient temperature will be logged for purposes of calculating the mean daily temperature for comparison with historical records and if possible, analysis of ambient temperature effects on emission rates. Up to sixteen (16) copper-constantan thermocouples (Type T) will be used to sense temperatures throughout the buildings. The sensors will be calibrated prior to and following each monitoring period using a constant-temperature bath. Capacitance-type RH/temp probes will monitor ambient air temperature and relative humidity in the exhaust air and in ambient air outside the buildings.

Building static pressure will be monitored continuously at the center of the MV buildings using a differential pressure transmitter. The purpose of pressure measurements is to monitor operation of the ventilation system and to aid in the calculation of fan airflow.

Air samples for odor analysis will be collected biweekly from the buildings on a grab sample basis using Teflon sample tubing and 10-L Tedlar bags. Samples will be taken directly from the sampling manifold exhaust in the trailer. A T-fitting installed in the exhaust line will enable samples to be collected using the pressure in the manifold to force air into the bag. The automatic sampling of the DAQ system will be interrupted during this procedure. The location in the building will be manually selected. The bag will be filled 1/3 full for preconditioning after at least seven minutes of equilibrium time at a given location. The bag will be emptied and then filled with a sample.

Collecting the air samples in the trailer will reduce risk of sampling and human error due to working outside the fans in potential weather extremes. Collecting samples from inside the building is not advisable because of animal disturbance, which would increase the odor emission.

These samples will be taken in duplicate at an inlet location (background) and in triplicate at two exhaust locations (one per building) for a total of eight (8) samples. These samples will be analyzed for dilutions to threshold (DT) within 30 h of collection using the same type of olfactometer (AC'SCENT® International Olfactometer, St. Croix Sensory, Inc., MN) in the respective states. The time of sampling will be determined based on site-specific information. The criteria may be:

1. peak nuisance times.
2. comparability to other building types.
3. representative of the odor emissions from this building.
4. valid data for input to setback guidelines and models, and air dispersion models.
5. correlation with gas and dust concentrations.

Gas, odor and PM emission rates will be calculated by multiplying concentration differences between inlet and outlet air by building airflow rates. Emission rate will be calculated every sampling period, e.g., 10 min.

4. Quality Objectives and Criteria for Measurement Data

The overall data quality objective of this research is to generate data of sufficient quality to satisfy the objectives of the project stated above. Data will undergo quality assurance review, which will assess, among other things, representativeness, completeness, comparability, accuracy, and precision.

Data representativeness is a measure of the degree to which data accurately and precisely represent a characteristic of a population parameter at a sampling point or for a process condition or environmental condition (USEPA. 1998. *EPA Guidance for Quality Assurance Project Plans*. EPA QA/G-5).

Data completeness is a measure of the amount of valid data obtained from a measurement system, expressed as a percentage of the number of valid measurements that should have been collected (*i.e.*, measurements that were planned to be collected) (USEPA. 1998. *EPA Guidance for Quality Assurance Project Plans*. EPA QA/G-5). Data completeness will be achieved by assuring that valid data obtained from the measurement system will be no less than 75% of the scheduled sampling.

Data completeness will be obtained by 1) monitoring only one site, thus eliminating time loss due to installation and set up, 2) using properly maintained and reliable instrumentation, 3) maintaining a ready supply of spare parts, 4) installing electrical backups, and 5) regular calibration.

Data comparability will be maintained by 1) employing similar analytical methods used in recent emission studies in confined livestock and poultry facilities, 2) comparison of measured results with previous mass balance and emissions rate estimates reported for swine and poultry buildings, and 3) using common equipment and protocol.

Accuracy and precision of the NH₃ measurement will be assessed by challenging the measurement system with zero air, a known concentration of NH₃ span gas (dual-certified by NIST-traceable gravimetric formulation and analysis based on vendor reference standard), and a known concentration of NIST-traceable nitric oxide (NO) span gas. Ammonia concentration measurement will be performed in accordance with the *TEI Model 17C Chemiluminescence NH₃ Analyzer Instruction Manual*.

Accuracy and precision of the hydrogen sulfide measurement will be assessed by challenging the measurement system with zero air, a known concentration of hydrogen sulfide (H₂S) span gas and a known concentration of sulfur dioxide (SO₂) span gas. Hydrogen sulfide concentration measurement will be performed in accordance with the *TEI Model 340 H₂S Converter Instruction Manual* and *Model 43C Pulsed Fluorescence SO₂ Analyzer Instruction Manual*.

Accuracy and precision of the PM measurement will be assessed in accordance with the equipment manufacturer's instructions. The filter weighing balance must be calibrated prior to and following the study. Particle size distribution will also be assessed using three methods: 1) a cascade impactor, 2) an TSI Aerodynamic Particle Sizer, and 3) a coulter counter.

Accuracy and precision for the carbon dioxide measurement will be assessed by challenging the measurement system with zero air and a known concentration of carbon dioxide (CO₂) span gas. Carbon dioxide concentration measurement will be performed in accordance with the *MSA Model 3600 NEMA 4X Infrared Gas Monitor Instruction Manual*.

Failure to achieve any of the acceptance criteria triggers an immediate examination of sampling and/or analytical practices in order to correct the problem before the next round of scheduled sampling.

5. Special Training/Certification

Field measurement personnel will have demonstrated training and experience through university or industry-equivalent training.

6. Documents and Records

[Each contractor] will maintain manual entry field logs including, but not limited to, site drawings, daily notes about the monitoring operation and the production buildings, results of in-field quality control checks, and any deviations from this QAPP.

[The contractor] will keep record of mortalities, animal inventory and weights, water and feed consumption, and the occurrence of special activities, e.g., floor sweeping, generator tests, manure removals or agitation, ventilation interventions, cleaning, etc.

Field test documentation and electronic data storage will be maintained in accordance with standard operating procedures, Table 3, including storage of all electronic data in ASCII file format for later analysis using commercially-available spreadsheet and statistical programs. All electronic data will be backed up daily on a redundant computer hard drive.

Records resulting from this project will be retained for a period of not less than five years following the end of the project.

B. Measurement Data Acquisition

7. Experimental Design

7.1. Gas Concentration Sampling and Measurement

Measurements of gas concentrations will be conducted sequentially at multiple individual and grouped locations (Figure A1). An air sampling system will allow automatic sequential air sampling through Teflon tubes (1/4" ID). Air from inlet air and indoor air locations will be combined from three air sampling points with mixing manifolds. A filter will be installed at the end of each air sampling tube to remove particulates. The selected air stream will pass through Teflon tubes and sampling manifolds.

Sampling locations

At each barn, air will be sampled from the animal breathing zone, the incoming ventilation air, and four selected exhaust locations. Gas concentrations in the selected air sample stream will be measured continuously for 10 min before switching to another sample stream. The first nine minutes of gas concentration data will be ignored to allow the measurement system to stabilize. The response time of the system will be tested to ascertain that ten minutes is a long enough

sampling period.

Gas analyzers

One set of gas concentration analyzers will be used to measurement gas concentrations. Each set contains an NH₃ analyzer (Model 17C, Thermo Environmental Instruments (TEI), Franklin, MA), an H₂S Analyzer (TEI Model 45C) and a CO₂ analyzer (Model 3600, Mine Safety Appliances, Co., Pittsburgh, PA or equivalent). Gas concentrations measured with these analyzers will be used to calculate gas emission rates.

Sampling sequences

An air sampling system will be constructed to allow automatic sequential air sampling at the 12 sampling locations (6 per building) using an array of 12 solenoids. The change of sampling sequence will be accomplished by modifying the waveform file of the data acquisition program (LabView).

Bypass pumping will be used to continuously purge all tubes except the currently sampled tube continuously. The bypass pump will draw air from manifold M1 (Figure 1), which in turn takes in air from all nonsampled tubes via 3-way solenoid valves.

Air sample transportation

Teflon tubes will be used to transport air from sampling locations to the mobile lab. An in-line Teflon PFA filter holder that houses a Teflon PTFE 50-mm membrane will be installed in each air sampling line at the sampling location to remove particulates.

A vacuum pump (P1) will pull air from a selected sampling location via solenoids #1 to #12 and a Teflon manifold (M2), and transport the air stream to another Teflon manifold (M3), which connects to each gas analyzer with a short 1/8" i.d. and 1/4" o.d. Teflon tube. The wetted surface of P1 will be coated with Teflon PTFE. The internal pumps (not shown in Figure A1) and the external pump (P2) of the gas analyzers will pull air from M3. All air stream connections between M2 and the solenoids will be short 1/4" i.d. and 3/8" o.d. Teflon tubing.

A differential pressure transmitter, dP1 capable of measuring of at least plus or minus 50 Pa will be used to monitor air sample transportation. This allows remote checking via the DAQ system.

7.2. PM sampling

Total suspended particles will be sampled continuously with the TEOM instrument at one minimum winter ventilation fan in each building, side by side with an air sampling point. The sampling location will be inside the building near the inlet of the fan, however, far enough away to avoid concerns about isokinetic sampling. The air velocity around the sampling head should

be 400 fpm (2 m/s) or less. This corresponds to the minimum air velocity in a tunnel ventilated building in the summer. Periodic measurements of particle size distribution will be conducted using a multistage cascade impactor, and aerodynamic particle sizers (TSI Model APS 3320 0.5-20 μ m particle analyzer and a TSI Model APS DPS dynamic particle sizer for 0.3 to 700 μ m particles).

7.3. Temperature and Relative Humidity Measurement

Temperatures at the air sampling locations (five exhaust fans and air inlets) will be measured with Type T (copper-constantan) thermocouples. The thermocouples will be used with a 16-bit thermocouple board (FP-TC-120, National Instruments, Austin, TX).

An electronic RH/temp transmitter (Model HMW61, Vaisala, Woburn, MA) housed in a NEMA 4 enclosure will monitor temperature and relative humidity at a representative exhaust location in each building (Figure A1). An electronic RH/temp transmitter with a passive solar radiation shield (Model HMD60YO, Vaisala, Woburn, MA) will be used to measure temperature and relative humidity at a representative outdoor location between the buildings. Both rh/temp transmitters (Models HMW61 and HMD60YO) use a HUMICAP sensor unit with $\pm 2\%$ accuracy between 0 and 90% RH and $\pm 3\%$ accuracy between 90 and 100% RH.

A salt calibrator kit (Model HMK1520000A01000, Vaisala, Woburn, MA) will be used to calibrate the sensors prior to commencing the study, every three months thereafter and at the end of the study. Though unbudgeted for this project, a portable rh/temp probe (Model HMP46, Vaisala, Woburn, MA) with an indicator (Model HM141, Vaisala, Woburn, MA) can optionally be used as a NIST-transfer device to calibrate the rh/temp transmitters.

7.4. Pressure Measurement

Building static pressure will be monitored continuously at the center of the MV buildings using a differential pressure transmitter (Ashcroft Model IXLDP, Part No. C1J3CXB2542ST01P1IWL, Dresser Instruments, Stratford, CT or Setra Model 267 MR 1FS, 0-10 VDC output or equivalent) with an accuracy of $\pm 0.25\%$. Zero calibrations of the pressure sensors will be conducted by shunting the sensor inputs. Static pressure taps will be constructed to minimize effects of air movement from wind on the measurement.

7.5. Ventilation Fan Monitoring

The operation of the building ventilation fans will be monitored continuously and checked every second (1.0 Hz sampling rate). The electric signals of the fan operations will be picked up from the ventilation control system (via auxiliary contacts of the motor relays) and connected to the data acquisition system in the mobile lab. An average of 60 readings will be recorded on disk every minute.

Individual fan air delivery rate will be calculated using the fan curve determined by tests conducted with the FANS analyzer in conjunction with the published fan curve for the fan and the measured differential static pressure. Since all the fans installed in the building are identical, the total building airflow rate will be calculated by multiplying the representative fan airflow rate by the number of operating fans. The representative fan airflow rate will be determined by measuring 25% of the fans with the FANS analyzer. If the coefficient of variation of the selected fans is greater than 5%, then additional fans will be evaluated with the FANS analyzer. The accuracy in measuring daily mean building airflow in this way is estimated to be $\pm 10\%$.

Because wind pressure can have a significant effect on fan airflow, a relatively small vane anemometer (SVA) may be installed on at least one fan on each sidewall to monitor airflow rate continuously. The SVAs would need to be calibrated during the BESS tests and the in-field tests with the FANS analyzer.

Wind speed and direction which can influence fan airflow will also be monitored continuously with a wind direction vane and a cup anemometer.

8. Sampling Methods

For determining emission factors, odor samples will be collected from ventilation inlet and outlet locations of each building. Samples will be taken in the morning and analysis in the odor lab will occur in the afternoon of the same day.

Samples will be collected using 0.05 mm thick, 10- to 50-L Tedlar™ bags with polypropylene fittings. The bags will be flushed with either compressed air or nitrogen gas at least three times prior to sampling. New bags will be used for each sample collection.

The bag will be attached to a T-fitting at the outlet of manifold M3, Figure 1, and allowed to fill under the pressure created by the sampling pump. The automatic solenoid control function will be interrupted to allow manual selection of the air sampling location for odor sampling. To reduce absorption losses, 2-3 L of sample air will be introduced into each bag and removed before filling the bag with sample air.

9. Sample Handling and Custody

Dust filters used with the cascade impactor to determine particle size distribution will be inspected for contamination and defects before using. After sampling, the filters will be removed from their holders and be visually inspected prior to delivery to the lab. Considerable care will be taken when removing the filter from the holder to ensure fibers are not lost. The filters will be equilibrated at a set temperature ($20 \pm 1^\circ$) and relative humidity ($30 \pm 5\%$) for at least 24 hours prior to pre- and post-weighing, and weighed using standard protocol for gravimetric analysis.

Odor and dust samples will be labeled and logged on standard field data sheets at the time of

placing and collecting the samples. The samples will then be transferred directly to the laboratory for evaluation. Information on the dust filter data sheets includes date, time of day, personnel, sampling location, airflow rate, sampling start time, sampling stop time, temperature, any unusual conditions or observations, weight of pre-sampling, weight of post-sampling, and PM concentration. Information on the odor sample data sheets includes date, time of day, personnel, sampling location, sampling start time, sampling stop time, temperature, and any unusual conditions or observations. All field data will be recorded and checked for completeness and accuracy before leaving the site. Laboratory data sheets will be prepared and signed as samples are processed. Chain of custody will be documented with signatures of those who relinquish and receive the samples.

10. Analytical Methods

Approved analytical methods will be used in all experiments. Analytical data will be generated in accordance with the standard operating procedures and instrument manufacturer's manuals.

Researchers will undertake corrective actions for gas and particulate concentration measurements. Corrective action will be necessitated by any deviation from published procedure or instruction.

11. Quality Control

Quality assurance and quality control includes the use of properly maintained and reliable instrumentation, approved analytical methodologies and standard operating procedures, external validation of data, well-trained analysts, electrical backups, audits, and documentation. When appropriate, published EPA analytical methodologies will be used. Logs will be maintained for each instrument.

Quality control procedures will include the following:

- Calibrations of gas analyzers will be conducted weekly.

- The TEOM PM10 monitors will be calibrated using FRM method PM10 samplers operated alongside.

- Calibrations of temperature sensors will be conducted before and after the test.

- Calibrations of the differential pressure transmitters will be conducted before and after the test. Zero checks will be conducted monthly.

- On-line results of all the continuous measurement variables will be displayed on a PC video monitor and published to the web where continuous internet connection is possible.

- Research personnel will check the on-line display daily by either remote or on-site access.

- Logged data files in the PC in the previous day will be checked the next business day to find and correct any problems with the system.

- Experienced analysts will run all equipment.

- Internal performance and system audits will be performed.

A measurement of certified zero air will be included as field blank for gas concentration measurements once a week.

An uninterruptible power supply with battery backup will be used to prevent damage to sensitive equipment and data loss in case of power failure.

Surge suppressors will be used to protect the PC and the instruments.

During formal training, anosmic and overly sensitive odor panelists will be identified and removed from the panelist selection pool. In addition, panelists will be required to sign a form before each session attesting that rules for odor panelists were followed.

A reference odorant, n-butanol, will be used during each odor evaluation session to verify the performance of the olfactometer and of each panelist. The quality criteria for accuracy and repeatability as described by CEN TC264 will be adopted for this study.

The olfactometer airflow rates will be calibrated each day before and after testing.

Precision airflow calibrators (Mini-Buck, Gilian, Alltech) will be used to calibrate the airflows over the full range of dilutions to ensure accuracy and repeatability.

Panelists will must have at least a two- hour break between sessions.

Panelists will be required to serve as a trainee if they have not served in a session for two months or longer.

12. Instrument/Equipment Testing, Inspection, and Maintenance

All analytical equipment will be properly maintained and tested regularly to ensure they are functioning properly in accordance with the manufacturer's recommended intervals and acceptance parameters.

13. Instrument/Equipment Calibration and Frequency

Gas concentration analyzers will be calibrated in accordance with the manufacturer's instruction manuals. Certifications for calibration gases will be according to EPA protocol, where available for a given concentration. Regulators for calibration gas cylinders will be dual-valve stainless steel. The certified calibration gases will consist of zero air, nitric oxide (NO) in nitrogen, NH₃ in air, sulfur dioxide (SO₂) in nitrogen, hydrogen sulfide (H₂S) in nitrogen, and carbon dioxide (CO₂) in nitrogen. Calibrations of NH₃, H₂S and carbon dioxide analyzers will be conducted weekly.

Gas airflows of the PM sampler (TEOM) will be calibrated using precision airflow calibrators (Gilian Airflow Calibrators for 0.020-6 Lpm and 2-30 Lpm flow rates). Calibration will be conducted each time the filter is changed.

Temperature sensors will be calibrated prior to use and recalibrated at the conclusion of the test at 0 and 40 °C. A water bath and two precision thermometers (-8 to 32 °C and 25 to 55 °C, 0.1 °C precision) will be used for calibration.

The differential pressure transmitters will be calibrated prior to use and recalibrated at the

conclusion of the test at 0 and 25 Pa using a reference method.

Calibration records of gas analyzers and PM samplers will be maintained in accordance with the applicable standard operating procedure or instrument manufacturer's operation manuals.

Calibration records of the temperature sensors and pressure transmitters will be automatically saved in an electronic file.

14. Inspection/Acceptance of Supplies and Consumables

All atmospheric gaseous measurements will be traceable to dual-analyzed and certified standards from a reputable supplier. The NH₃ span gas will be dual-certified by NIST-traceable gravimetric formulation and analysis based on vendor reference standard. No additional requirements are applicable.

15. Data Acquisition Requirements (Non-Direct Measurement)

Not applicable.

16. Data Management

Instrumental data will be collected and stored in accordance with the applicable standard operating procedure or instrument manufacturer's operations manual. Raw data will be saved as tab delimited ASCII files for future reference.

All ammonia, hydrogen sulfide, carbon dioxide, PM, temperature, pressure and relative humidity data will be electronically stored and compiled in a manner that will facilitate computation of hourly and daily averages.

The research staff will keep the following logs: daily notes including site drawings, deviations from QA, and other notations. The logs will contain measurement activities and monitoring notes. The research staff will collect building management and production notes from the producer. A third party witness will sign and date all log notes. All notes will be contained in a centralized notebook. All necessary records for additional monitoring instruments will also be kept.

If an error is made on an accountable document assigned to one person, that individual may make corrections simply by crossing out the error and entering the correct information. The erroneous information should not be obliterated. Any error discovered on an accountable document should be corrected by the person who made the entry. All corrections must be initialed and dated.

All original and final data will be reviewed and/or validated by technically qualified staff, and so

documented in the program records. The documentation will include the dates the work was performed, the name of the reviewer(s), and the items reviewed or validated.

Reports will be prepared by qualified staff only from properly reviewed and validated data. All data will be reported in units consistent with other measurements. Deviations from approved procedures, assumptions, data uncertainties, QA/QC results, and external performance data will be documented and reported. Assumptions will be clearly explained as to validity and limitations.

A large portion of the data will also be maintained electronically in the form of spreadsheets. Electronic raw data and computer records will be backed-up weekly on a network drive (backed up daily) with copies stored at the laboratory. In addition to computer storage, raw tables or graphs will be printed out and stored in a loose-leaf notebook in the laboratory.

All field data must be recorded in a permanent manner as follows:

- Manual original entries must be recorded in permanent ink.
- Instrument generated original data may be printed as hard copy and/or may be electronically archived into a corporate archive system; unless otherwise specified, a hard copy printout must be produced for archiving purposes.

Corrections and additions to original data must be made as follows:

- After correction, original entries must remain legible (for manual corrections) or intact (for computerized corrections).
- The correction or addition must be readily traceable to the date and staff who performed the correction or addition.
- Corrections must be explained.

Accurate working files of all documentation, including logbook entries, original data, calculations, deviations from approved procedures, assumptions, audits, and review, inspection, and validation will be maintained by [the contractor]. Project records will be maintained in a systematic and logical form and adequately filed for rapid retrieval, accounted for and appropriately indexed.

C. Assessment/Oversight

17. Assessments and Response Actions

Data will be assessed for their representativeness, completeness, comparability, accuracy and precision as outlined in Section 4.

18. Reports to Management

The draft and final project reports will contain all valid monitoring data expressed as hourly and daily values. The report will incorporate graphical representations of the location of all measurements taken. The report will also contain the numerical and qualitative results of all quality control measures on all measurement systems and will compare them to the applicable acceptance criteria. In the event that data must be invalidated, the reason for data invalidation shall be identified with the resultant corrective action.

Review drafts and the final report will be distributed to Cary Secrest and Kevin Vuilleumier.

D. Data Validation and Usability

19. Data Review, Verification, and Validation

All data generated under this QAPP will be reviewed and validated by [insert names].

Raw data review will be done within two business days after the data were recorded from measurement. Verification of the measurement data will be done during initial processing each week using Engine99, a data processing program developed by Dr. Heber.

20. Validation and Verification Methods

Data will be validated and verified by comparison with instrumental performance parameters as identified in the applicable standard operating procedure or instrument operation manual. Data validation and verification will also be performed by checking the recorded test activity and change of the building environment. Data will be evaluated for compliance with stated objectives for representativeness, precision, and accuracy. However, the evaluation process used to find and correct an error may not be defined in this QAPP because not all possible errors and corrections can be anticipated.

21. Reconciliation with User Requirements

Any data not meeting the data quality objectives as outlined above will be flagged as invalid for comparison to screening level criteria.

Table 1. Sample Collection and Analysis

<u>Location</u>	<u>Matrix</u>	<u>Parameters</u>	<u>Frequency</u>
Building exhaust	Air	Odor	Biweekly
Building inlet	Air	Odor	Biweekly
Building exhaust	Air	PM	Weekly

Table 2. Data Quality Requirements

Parameter Matrix	Sample Limit	Detection Limit	Quantitation Accuracy	Estimated Precision	Estimated
NH3	Air	2 ppb	200 ppm	±15%	±5%
H2S	Air	1 ppb	10 ppm	±15%	±5%
CO2	Air	50 ppm	2,000 ppm	±15%	±5%
CO2	Air	200 ppm	10,000 ppm	±15%	±5%
PM10	Air	1 ug/m3	10,000 ug/m3	±15%	±5%
Airflow	Air	0.05 m3/s	12 m3/s	±30%	±10%
Odor	Air	30 OU/m3	40000 OU/m3	50%	20%
Temperature	Air	-40 C	50 C	1 C	0.5 C
RH	Air	5%	95%	5%	2%
D. Pressure	Air	-50 Pa	50 Pa	2%	0.25%
Wind speed	Air	1 m/s	60 m/s	2%	2%
Wind direction	Air	0 deg	360 deg	3 deg	3 deg.

Table 3. Analytical Method References

Parameter	Sample Matrix	References
Odor	Air	CEN, 2001

Table 3. Standard Operating Procedures

1. Producer collaborations
2. Air sampling system
3. Ammonia analyzer
4. Hydrogen sulfide analyzer
5. Carbon dioxide analyzer
6. Real-time PM10 monitor
7. Relative humidity sensors
8. Temperature transducers
9. Wind anemometry
10. Differential static pressure transmitters
11. Fan airflow measurements
12. Data acquisition hardware
13. Data acquisition software
14. Odor sampling
15. Odor evaluations with olfactometry and intensometry
16. Gravimetric TSP and PM10 samplers
17. Particle size distribution
18. Manure sampling

- 19. Manure evaluation
- 20. Data management

Table 4. Monitoring Site Information